

# Finding Vertex of a Parabola

Maximum or Minimum value

- From vertex form:  $y = a(x-h)^2 + k$

Vertex is  $(h, k)$

- From standard form:  $y = ax^2 + bx + c$

$$X_{\text{of vertex}} = \frac{-b}{2a}$$

Plug that x back into  $y =$

Ex:  $f(x) = x^2 - 4x + 3$

$\rightarrow a=1 \quad b=-4 \quad c=3$

$$x = \frac{-b}{2a} = \frac{-(-4)}{2(1)} = \frac{4}{2} = 2 \rightarrow \text{vertex is } (2, ?)$$

plug  $x=2$  into  $y$ :

$$f(2) = 2^2 - 4(2) + 3$$

$$= 4 - 8 + 3 = -1 \rightarrow \text{this is the y-value of vertex}$$

vertex  $(2, -1)$

Ex 2:  $f(x) = 2x^2 + 8x - 5$

$\rightarrow a= \quad b= \quad c=$

$$x = \frac{-b}{2a} =$$

$$f( ) =$$

vertex  $( \quad , \quad )$

## Is the Vertex a Max or Min?

- positive a-value → happy opens up



Since the vertex is at the bottom, it's the lowest point or Minimum value.

- negative a-value → sad opens down reflected



Since the vertex is at the top, it's the highest point or Maximum value.

## Practice

- Determine whether each function has a Maximum or Minimum value.
- Find the Max or Min value (vertex).

1)  $f(x) = x^2 + 6x - 2$

2)  $f(x) = -x^2 - 9$

\*careful!

3)  $f(x) = 3 - x^2 - 6x$

4)  $f(x) = x^2 - x - 6$

5)  $f(x) = \frac{3}{4}x^2 - 5x - 2$